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(FILE 'HOME' ENTERED AT 11:42:42 ON 29 SEP 2001)

FILE 'REGISTRY' ENTERED AT 11:42:51 ON 29 SEP 2001

L1 1 (C<.008 AND SI<2 AND MN<3 AND P<.01 AND 12<NI<22 AND 3<MO<7 AND
L2 56 (CR<4 AND 12<NI<22 AND 3<MO<7 AND CO<7 AND 50<FE)/MAC

FILE 'HCA' ENTERED AT 11:45:04 ON 29 SEP 2001

L3 47 L2
L4 42799 (NICKEL OR NI) AND (MOLYBDENUM OR MO) AND (IRON OR FE)
L5 17 L3 AND L4
SELECT IPC L5 1 6
L6 90158 E1-6
L7 256 L6 AND MARAG?(1A)STEEL
L8 39 L7 AND L4 AND (IRON OR FE) (1A) (BAS? OR REMAIN? OR BALAN? OR RES
L9 39 L8 NOT L5

AN 135:49230 HCA
 TI **Maraging** Ni steel for strip having high fatigue strength
 IN Uehara, Toshihiro; Fujita, Etsuo
 PA Hitachi Metal, Ltd., Japan
 SO Eur. Pat. Appl., 13 pp.
 CODEN: EPXXDW
 DT Patent
 LA English
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 1111080	A2	20010627	EP 2000-127544	20001215
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO				
	JP 2001240943	A2	20010904	JP 2000-297020	20000928
	US 2001006081	A1	20010705	US 2000-739387	20001219
	JP 2001240944	A2	20010904	JP 2000-386064	20001219
PRAI	JP 1999-367997	A	19991224		

AB The **maraging** steel having high fatigue strength contains C .ltoreq.0.008, Si 0-2.0, Mn 0-3.0, Ni 12-22, Mo 3.0-7.0, Co <7.0, Ti .ltoreq.0.1, Al .ltoreq.2.0, N .ltoreq.0.005, P .ltoreq.0.010, S .ltoreq.0.005, and O .ltoreq.0.003%, optionally with Cr .ltoreq.4.0%, Nb .ltoreq.1.0, Ta .ltoreq.2.0, W .ltoreq.2.0, and/or B .ltoreq.0.01%. The total amt. of [3Si + 1.8Mn + Co/3 + Mo + 2.6Ti + 4Al] for stable hardening is 8.0-13.0%, and the Co content is lower than 8-15% in conventional **maraging** steel. The steel strip is preferably finished by surface **nitridation** for compressive **residual** stress to promote increased fatigue strength. The typical **maraging** steel for **nitrided** strip 0.3 mm thick contains mainly C 0.005, Si 0.31, Mn 0.02, Ni 18.3, Mo 5.4, Co 6.9, Ti 0.007, Al 0.11, N 0.001, P 0.002, and S 0.001%. The **nitrided** strip showed the surface microhardness of 865, the interior microhardness of 570, and **residual** compressive stress of 1301 psi.

AN 123:176011 HCA
 TI **Iron-cobalt-nickel** alloys with minor niobium for
 sintered maraging parts of casting dies and hot-working tools
 IN Pinnow, Kenneth E.; Liimatainen, Jari; Dorsch, Carl J.
 PA Rauma Materials Technology Oy Corp., Finland; Crucible Materials Corp.
 SO Eur. Pat. Appl., 20 pp.
 CODEN: EPXXDW

DT Patent
 LA English

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 665301	A1	19950802	EP 1994-118344	19941122
	EP 665301	B1	19990310		
	R: AT, DE, FR, GB, IT, SE				
	AT 177479	E	19990315	AT 1994-118344	19941122
PRAI	US 1993-162660		19931207		

AB The **Fe-alloy** powder for sintered maraging parts of die-casting app. contains **Ni** 10-23, **Co** 7-20, **Mo** .ltoreq.10, **Al** .ltoreq.2.5, **C** .ltoreq.0.02, **B** .ltoreq.0.003, **N** .ltoreq.0.05, and preferably **Nb** 0.05-0.5%. The low-C maraging alloys are hardened by pptn. of intermetallic compds., and do not contain **Ti** assocd. with conventional **maraging steels**. The powder is compacted by hot-isostatic pressing, and the block preforms are sintered, optionally hot worked at 760-1260.degree., and soln. annealed to obtain machinable blocks for manuf. of shaped parts. The **Fe alloy** for the sintered blocks showing Rockwell C-scale hardness of 30 after annealing contains mainly **Ni** 17.63, **Co** 11.11, **Mo** 4.95, **Nb** 0.18, and **Mn** 0.02%.

AN 76:17082 HCA
 TI **Maraging steel**
 IN Birman, S. R.; Assonov, A. D.; Pimenova, A. Z.; Vel'mozhnyi, E. Ya.;
 Aslibekyan, F. S.
 PA Moscow Evening Metallurgical Institute
 SO U.S.S.R.
 From: Otkrytiya, Izobret., Prom. Obraztsy, Tovarnye Znaki 1971, 48(27),
 101.
 CODEN: URXXAF
 DT Patent
 LA Russian
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	SU 313893		19710907	SU	19700119
AB	To increase the mech. properties of the maraging steel , Nb is added and the compn. is C .ltoreq.0.05, Mn 2-6, Ni 8-12, Mo 1-3, Co 0.5-3, Ti 1.5-3.5, Al 0.2-3, Nb 0.1-0.3%, and Fe the rest. B (.ltoreq.0.005%) may also be added to the steel.				

AN 80:73140 HCA
TI Precipitation hardenable steel of high tensile strength
IN Oda, Teishiro; Nakamura, Makoto
PA Mitsubishi Heavy Industries, Ltd.
SO Japan., 6 pp.
CODEN: JAXXAD
DT Patent
LA Japanese
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
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PI	JP 48025859	B4	19730801	JP 1964-38100	19640701
AB	The title steel contains C .ltoreq.0.06, Mn .ltoreq.0.6, Si <0.6, Cr 8-14, Ni 3-10 Co 4-10, Mo 2-5% or W replacing part or all of the Mo in a 2:1 ratio, and the balance Fe and incidental impurities. It is used for low-pressure steam turbine blades with excellent weldability, good formability in quenched condition and after pptn.-hardening has yield strength .gtoreq.100-140 kg/mm2. The quenched steel has a completely martensitic matrix and is aged at 450-550.degree. for several hr to obtain yield point .gtoreq.110-140 kg/mm2.				

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AN 77:91679 HCA
TI **Maraging steel**
IN Birman, S. R.
PA Moscow Evening Metallurgical Institute
SO U.S.S.R.

From: Otkrytiya, Izobret., Prom. Obraztsy, Tovarnye Znaki 1972, 49(16), 98.

CODEN: URXXAF

DT Patent

LA Russian

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	SU 338552		19720515	SU	19700416
AB	Maraging steel with increased hardness after nitriding has the compn.: C .ltoreq.0.03, Ni 8-12, Mo 1.5-4, Cr 3-8, Cu 0.5-3, Ti 0.3-1.2, Al 0.2-1.2, Zr 0.02-0.5, B .ltoreq.0.5%, and the rest Fe.				

AN 106:180547 HCA
TI AES analysis of fracture toughness variation with heat treatment in an
18Ni (250 grade) **maraging** steel
AU Misra, R. D. K.; Balasubramanian, T. V.; Rama Rao, P.
CS Def. Metall. Res. Lab., Hyderabad, India
SO J. Mater. Sci. Lett. (1987), 6(2), 125-30
CODEN: JMSLD5; ISSN: 0261-8028
DT Journal
LA English
AB The variation in fracture toughness (K_{Ic}) as a function of heat-treatment
temp. (820-1150.degree.-1 h) was studied for 18 Ni
maraging steel by AES anal. of fracture surface ppts. A min. in
K_{Ic} was found at heat-treatment temp. 925.degree., which is near the temp.
(950.degree.) for min. **grain** size (40 .mu.m). The K_{Ic} increases
with temp. >970.degree.. AES examn. of the impact-fracture surface shows
Ti, S, and C concns. of 3.4, 1.8, and 1.6%, resp. The **grain**
-boundary ppt. is believed to be Ti₂CS.

AN 120:249983 HCA
TI Aspects of physical metallurgy of a cobalt-free **maraging** steel
AU de Andrade, Arnaldo H. Paes; Padial, Armando G. Fernandes
CS IPEN, CNEN, Brazil
SO Metal. Mater. (1993), 49(420), 672, 674-80
CODEN: MEATEJ
DT Journal
LA Portuguese
AB Phase transformations were studied of Co-free **maraging** steel (VascoMax T-250) under solubilization and thermal aging at 450-600.degree.. The chem. compn. of VascoMax T-250 is Fe, C 0.008, Mn 0.03, P 0.005, S 0.001, Co 0.001, Mo 3.0 Ni 18.29, Cu 0.020 and Ti 1.30. Microstructural changes obsd. were pptn. of fine particles of Ni₃Ti, coalescence of coarse ppts., and martensite-austenite transformation. Max. Rockwell hardness was obtained for specimens treated at 480.degree. for 7-15 h and is characterized for fine ppts. of Ni₃Ti. The impact strength increased with temp., for treatments at 480-820.degree.. Solubilized and aged steels were ductile. For temp. >600.degree. and long treatment time, 7 to 15 h, there was a marked decrease in hardness and a reverse transformation of austenite. The mean **grain** size of the steel was 7.29 .mu.m, after thermal aging.

AN 108:60520 HCA
 TI **Nitridation** of thin **maraging**-steel bands
 IN Hasegawa, Junzo; Ogasawara, Takeo; Suzuki, Takatoshi; Oishi, Yoshihiro;
 Matsui, Munehisa; Nakanishi, Kazuyuki
 PA Toyota Central Research and Development Laboratories, Inc., Japan
 SO Jpn. Kokai Tokkyo Koho, 4 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 62224665	A2	19871002	JP 1986-66601	19860325
	JP 07116585	B4	19951213		

AB **Maraging** steel bands 0.1-0.3 mm thick for belt hoops are **nitrided** in decompd. NH₃ with 1-6% decompn. degree (residence time in a retort 600-3600 s) at 420-470.degree. and gauge pressure 0.01-0.03 kg/cm² for 1-6 h. Thus, an endless hoop (band thickness 0.17, width 8.6, and hoop inside periphery 704 mm) of a **maraging** steel contg. Ni 17.8, Al 0.08, Mo 4.76, Ti 0.48, Co 7.75, C 0.005, Si 0.038, S 0.003, and Mn 0.008% was soln. treated in vacuum at 800.degree. for 30 min, cooled in Ar-N, and **nitrided** at 440.degree. in decompd. NH₃ with decompn. degree 4% for 3 h to form a hard layer 20 .mu. thick, followed by furnace cooling. The **nitrided** hoop showed surface Vickers hardness 900 and **residual** compressive stress 160 kg/mm², vs. 850 and 80 kg/mm² for a similar hoop **nitrided** at 450.degree. and 12% NH₃ decompn. degree for 24 h.

AN 108:60514 HCA
 TI Manufacture of **maraging** steel parts of low wear and high fatigue strength
 IN Suzuki, Takatoshi; Oishi, Yoshihiro; Nakanishi, Kazuyuki; Matsui, Munehisa; Ogasawara, Takeo
 PA Toyota Central Research and Development Laboratories, Inc., Japan
 SO Jpn. Kokai Tokkyo Koho, 8 pp.
 CODEN: JKXXAF
 DT Patent
 LA Japanese
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 62192528	A2	19870824	JP 1986-34762	19860219
	JP 05082452	B4	19931119		
AB	<p>Bands, 0.1-1 mm in thickness and used for belt hoops, of maraging steel contg. Ni 17-26, Al 0.05-0.5, Mo 4-6, Ti 0.2-1.6, and Co 7-12% are soln. treated, worked to produce, at least in part, 10-60 kg/mm2 compressive residual stress, heated in NH3-based furnace atm. at 400-480.degree. for nitridation and aging, and addnl. aged at 470-580.degree. in a reducing atm.. The treated bands show low wear and increased fatigue strength. Thus, an endless hoop (band thickness 0.19, width 8.6, and hoop inside periphery 224 mm) of a maraging steel contg. Ni 17.75, Al 0.08, Mo 4.76, Ti 0.48, Co 7.75, C 0.0054, Si 0.038, and S 0.0003% was soln. treated in vacuum at 820.degree., cooled in Ar-N, stretched for 50 kg/mm2 stress, heated at 435.degree. in NH3 of > 99% purity for nitridation, and aged in Ar at 500.degree. for 2 h. The treated steel hoop showed surface Vickers hardness 1010 and surface compressive residual stress 150 kg/mm2.</p>				

AN 73:37811 HCA
TI Impact transition behavior of high-purity 18 nickel **maraging**
steel
AU Spaeder, G. J.
CS U. S. Steel Appl. Res. Lab., Monroeville, Pa., USA
SO Met. Trans. (1970), 1, 2011-14
CODEN: MTGTBF
DT Journal
LA English
AB Recent tests of high-purity 18Ni **maraging** steel at 75 to
-320.degree.F showed that the **residual** elements markedly affect
the impact behavior of the material. The Ti(C,N) ppt. controls the
toughness and may form in greater or lesser amts. depending on the
hot-rolling procedure and subsequent heat treatments. The relatively low
room-temp. impact values and the absence of any marked transition temp.
behavior in normal purity **maraging** steels reflect primarily the
occurrence of intergranular fracture at grain boundaries at which films of
comps. of the **residual** elements have segregated.